MATH 133 – Calculus with Fundamentals 1
Practice on Absolute Values and Intervals
September 4, 2015

Background

Recall from the video "lecture" for today that the absolute value of a real number is defined as

$$|x| = \begin{cases} x & \text{if} x \geq 0 \\ -x & \text{if} x < 0. \end{cases}$$

Also, we have several different types of *intervals* in the real number system written as follows:

$$(a, b) = \{x \mid a < x < b\} \tag{1}$$
$$[a, b] = \{x \mid a \leq x \leq b\} \tag{2}$$
$$[a, b) = \{x \mid a \leq x < b\} \tag{3}$$
$$(a, b] = \{x \mid a < x \leq b\}. \tag{4}$$

Today we will practice on some problems related to these ideas.

Questions

1) The set of real numbers x satisfying $|x| < 17$ is an interval. Write it using the appropriate interval notation.

2) The set of real numbers x satisfying $|x - 3| \leq 1$ is also an interval. Write it using the appropriate interval notation.

3) The set of real numbers x satisfying $|3x + 1| < 4$ is also an interval. Write it using the appropriate interval notation.

4) Write the interval $(5, 9)$ in the form: "the set of all x such that $|x - c| < r$ for some real numbers c and r.

5) Same as question 4, but for the interval $\left[-\frac{2}{5}, 3\right]$.

5) Using the following graph of temperature over a 24-hour period a particular location, answer these questions:

   (a) Write the collection of all *temperatures* measured over the 24 hour period as an interval $[a, b]$ for suitable temperature values a, b in degrees Fahrenheit. (There's an unstated assumption behind this question. Can you see what that is? Does it seem reasonable to make that assumption?)

   (b) Estimate the interval $[c, d]$ of *times* in hours for which the temperature was 16.8 degrees or less.

(c) At how many different times does it appear that the temperature was exactly 40 degrees F?

Note: The temperature values at the start of each hour are given in the table at the right.